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- (74) Agent: **VOLMER, Georg**; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
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- Published:**
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(54) Title: **LAMP CAP, ASSEMBLY OF LAMP BURNER AND LAMP CAP, AND METHOD OF FASTENING A LAMP**

(57) Abstract: A lamp cap with a spring cup for retaining a lamp burner, for which it is proposed that the spring cup has at least three spring legs which each have substantially only one degree of freedom. The spring legs are arranged such that the three degrees of freedom enable a displacement possibility of the spring cup in a displacement plane and are linearly independently aligned in this displacement plane.

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Lamp cap, assembly of lamp burner and lamp cap, and method of fastening a lamp

The invention relates to a lamp cap with a spring cup for retaining a lamp burner.

In the prior art as described in EP 0 43 155 A1, two additional alignment axes for a better positioning of a lamp coil can be utilized by means of an intermediate adapter or a prefocus ring. This is advantageous because the position of the coil differs from lamp to lamp. Said additional axes may enable an improved adjustment facility for the coil with reference to fixedly defined reference points on a lampholder. This is of importance in particular in connection with modern runway reflectors which impose extremely high requirements on the alignment. The intermediate adapter or prefocus ring used for this, however, is comparatively expensive.

It is an object of the invention to realize a positioning possibility for the coil with respect to defined reference points agreed with a manufacturer of lampholders which is as inexpensive as possible.

This object is achieved in that a spring cup of a lamp cap comprises at least three spring legs which each have substantially only one degree of freedom and which are arranged such that the three degrees of freedom allow a displaceability of the spring cup in a displacement plane, said degrees of freedom being arranged linearly independently of one another in this displacement plane. The intermediate adapter or prefocus ring used until now may be omitted as a result, which reduces the manufacturing cost. The displacement plane mentioned above may be formed by a plane perpendicular to the longitudinal direction of a lamp or alternatively by a plane arranged parallel to a lamp cap. Furthermore, the plane may be formed perpendicularly to the Z-axis.

To achieve a constructionally simple solution, it is suggested that at least one of the spring legs is a blade spring. Furthermore, the simple construction of the spring cup renders it possible to realize an inexpensive automated manufacture of the lamp with low investment and maintenance cost.

It is suggested as a further solution in an assembly of lamp burner and lamp cap that the lamp is fixedly connected to the springs, at least one spring leg in the connected

state being subject to a force which is directed in the displacement plane perpendicularly to the direction of the degree of freedom.

The lamp can be kept in its position as a result of this. This exertion of force can be recognized, for example, from the fact that the spring legs when being severed leap
5 away from the lamp axis over different distances. In addition, the lamp axis is shifted when the connection is loosed in an arrangement according to the invention.

The invention furthermore proposes a method of fastening a lamp in a lamp cap whereby the lamp is first aligned with reference to the lamp cap and is subsequently
10 fixedly connected to the spring cup, which method is characterized in that the lamp is aligned in the displacement plane and is kept in the aligned position until it is fixedly connected to the spring cup. A secure and simple position of the lamp in relation to defined reference points can be achieved thereby also with respect to the displacement plane.

To achieve an inexpensive assembling process, the invention provides that the lamp is welded to the spring cup. The proposed welding technique is advantageous as regards
15 its cost, in particular in an industrial mass manufacturing process. In addition, the use of a welding technique means that a proven connection technique is used which renders possible a simple automation.

It is suggested for a better positioning possibility that the lamp is aligned in accordance with a further degree of freedom. If an exact adjustment is to be achieved of
20 lamps, for example in runway reflectors, it is suggested that the lamp is aligned along at least five axes. Similarly, the lamp may also be aligned along six axes. A further quality improvement as regards the positioning of the coil, of several coils, or of a screening system within a given reference system can thus be achieved.

25 The arrangement of a lamp burner 1 and a lamp cap as shown in the Figure comprises a coil 2 arranged inside the lamp burner 1, a cylindrical fastening ring 3, a spring cup consisting of three blade springs 4, a fastening bush 5, and a cap 6.

The lamp burner 1 is clamped against the fastening ring 3 by the three blade springs 4 and kept in its position.

30 The blade springs 4 are arranged inside the fastening bush 5 such that the three degrees of freedom of the blade springs 4 provide a displacement possibility of the spring cup in a displacement plane extending perpendicularly to the Z-axis when the lamp burner 1 is shifted. Furthermore, the respective degrees of freedom of the blade springs 4 are linearly independently arranged in this displacement plane, as is apparent in the Figure, and thus

render possible an adjustment and fixation of the coil 2 with respect to a defined reference system, also with respect to the displacement plane.

Abbreviations for dimensional references in a reference system are given below by way of example: :

5

Z - axis	= e - dimension	= distance of coil 2 to reference
X - axis	= g - axis	
Y - axis	= h - axis	
α - tilting angle	= g1, g2 - values	= maximum skew position
10 β - tilting angle	= h1, h2 - values	= maximum skew position
φ - angle of rotation	(aligned by way of b1, b2 – dimension; 6 th degree of freedom)	

Thus, for example, a reference system for the H8 cap type lies on the inside of a reflector and is defined also for the present assembly as regards the lamp cap and its
15 reference points. The arrangement of the spring cup according to the invention renders it possible to align the coil 2 with respect to the given reference system in a very simple manner.

The spring cup formed from the blade springs 4 can be manufactured very inexpensively, since no more than three blade springs 4 are required for clamping in the lamp
20 burner 1.

The lamp burner 1 is connected to the blade springs 4 such that at least one of the blade springs 4 acts with a force lying in the displacement plane and perpendicular to the direction of the degree of freedom. The lamp burner is kept in its position thereby. This force action can be recognized, for example, from the fact that severing of the blade springs 4
25 causes the spring legs to leap different distances away from the lamp axis, or that the lamp axis is shifted through loosening of the connection.

Before welding, the lamp burner 1 is first aligned with reference to the cap 6, and in particular also in the displacement plane defined by the X- and Y-axes, and is kept in the aligned position until it has been fixedly welded to the spring cup. The springs adapt the
30 position of the coil 2 along the X-Y-axes during this. In addition, the angular position of the lamp can be influenced within given limits through shifting of the lamp burner 1 in the Z-direction and tilting through the angles α and β .

The 5-axis alignment method used is advantageous, for example, in the use of H7, H8, H9, H11, or 9004, 9005, 9006, 9007 cap designs because high alignment accuracies

can be achieved, for example with the use of a lamp burner 1 in combination with runway reflectors. Moreover, a further correction can be made through a further alignment about the ϕ -axis, so that in this case a 6-axis alignment is carried out. The term "axis" used in connection with the alignment of the lamp burner 1 represents the degree of freedom along which the lamp burner 1 can be shifted for the purpose of positioning the coil 2.

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CLAIMS:

1. A lamp cap with a spring cup for retaining a lamp burner, characterized in that

a spring cup of a lamp cap comprises at least three spring legs (4) which each have substantially only one degree of freedom and which are arranged such that the three degrees of freedom allow a displaceability of the spring cup in a displacement plane, said degrees of freedom being linearly independent of one another in this displacement plane.

2. A lamp cap as claimed in claim 1, characterized in that at least one of the spring legs (4) is a blade spring.

3. An arrangement of a lamp burner and a lamp cap as claimed in claim 1 or claim 2, characterized in that the lamp burner (1) is fixedly connected to the springs, at least one spring leg (4) in the connected state being subject to a force which is directed in the displacement plane perpendicularly to the direction of the degree of freedom.

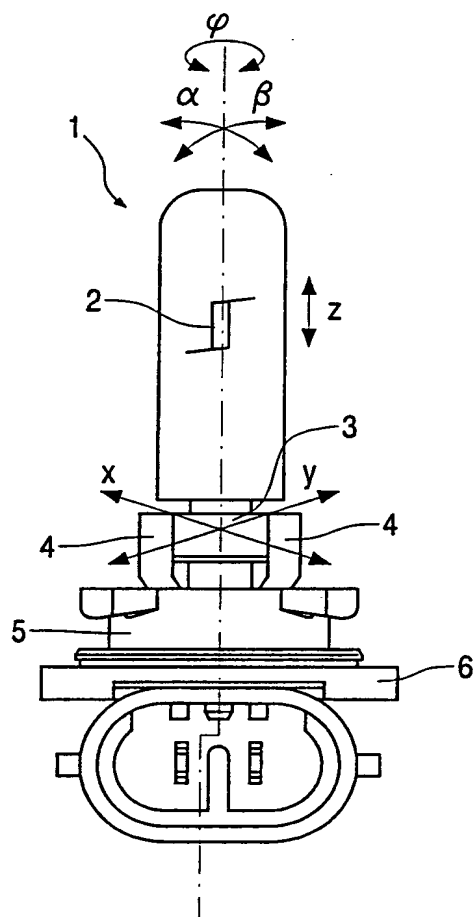
4. An arrangement of a lamp burner and a lamp cap as claimed in any one of the preceding claims, characterized in that the lamp burner (1) is fixedly welded to the spring cup in its holder.

5. A method of fastening a lamp in a lamp cap which comprises a spring cup as defined in one of the claims 1 and 2, wherein the lamp is first aligned with reference to the lamp cap and is subsequently fixedly connected to the spring cup, characterized in that the lamp burner (1) is aligned in the displacement plane and is kept in the aligned position until it has been fixedly connected to the spring cup.

6. A method of fastening a lamp burner as claimed in claim 5, characterized in that the lamp burner (1) is welded to the spring cup in its holder.

7. A method of fastening a lamp burner as claimed in claim 5 or claim 6, characterized in that the lamp burner (1) is aligned along at least one further degree of freedom.
- 5 8. A method of fastening a lamp burner as claimed in claim 7, characterized in that alignment takes place along at least five axes.
9. A method of fastening a lamp burner as claimed in any one of the preceding claims, characterized in that the lamp burner (1) is aligned along at least six axes.

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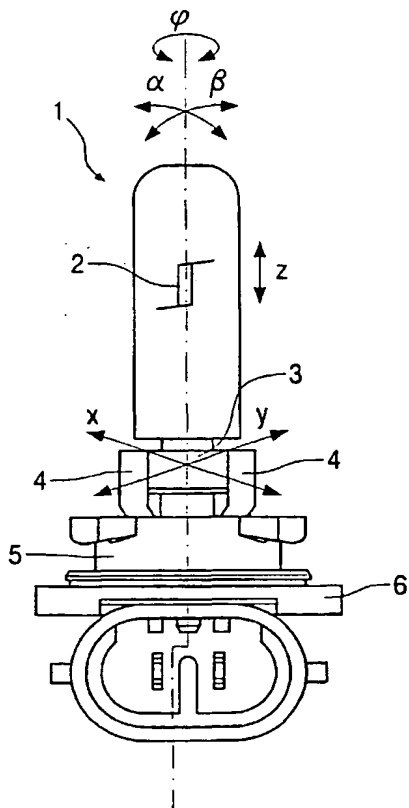
(71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01J5/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01J H01K F21V H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 428 261 A (WITTIG CHRISTIAN ET AL) 27 June 1995 (1995-06-27) column 4, line 21 - line 49; claim 7; figure 3	1,5
A	US 5 957 569 A (HELBIG PETER ET AL) 28 September 1999 (1999-09-28) column 2, line 50 - line 60 column 3, line 63 - column 4, line 35 column 5, line 20 - line 33; figures	1,5
A	GB 1 032 163 A (PRESSAC LTD) 8 June 1966 (1966-06-08) figures	1,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5428261	A	27-06-1995	DE 4223643 A CA 2099687 A EP 0580013 A HU 65055 A JP 6060801 A	20-01-1994 18-01-1994 26-01-1994 28-03-1994 04-03-1994
US 5957569	A	28-09-1999	AU 7619996 A BR 9607821 A CA 2215068 A CZ 9702850 A WO 9725733 A DE 19681219 D DE 59601558 D EP 0815578 A ES 2131967 T HU 9800716 A JP 11502365 T PL 322115 A	01-08-1997 07-07-1998 17-07-1997 17-06-1998 17-07-1997 18-06-1998 06-05-1999 07-01-1998 01-08-1999 28-07-1998 23-02-1999 05-01-1998
GB 1032163	A	08-06-1966	NONE	

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PHDE000045W0	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 12722	International filing date (day/month/year) 14/12/2000	(Earliest) Priority Date (day/month/year) 17/12/1999
Applicant KONINKLIJKE PHILIPS ELECTRONICS N.V.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

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☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 00/12722

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A lamp cap with a spring cup for retaining a lamp burner (1), for which it is proposed that the spring cup has at least three spring legs (4) which each have substantially only one degree of freedom. The spring legs (4) are arranged such that the three degrees of freedom enable a displacement possibility of the spring cup in a displacement plane and are linearly independently aligned in this displacement plane.

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IPC 7 H01J5/60

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01J H01K F21V H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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EPO-Internal, WPI Data, PAJ

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- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

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Name and mailing address of the ISA

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Authorized officer

Martín Vicente, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5428261	A	27-06-1995	DE 4223643 A CA 2099687 A EP 0580013 A HU 65055 A JP 6060801 A	20-01-1994 18-01-1994 26-01-1994 28-03-1994 04-03-1994
US 5957569	A	28-09-1999	AU 7619996 A BR 9607821 A CA 2215068 A CZ 9702850 A WO 9725733 A DE 19681219 D DE 59601558 D EP 0815578 A ES 2131967 T HU 9800716 A JP 11502365 T PL 322115 A	01-08-1997 07-07-1998 17-07-1997 17-06-1998 17-07-1997 18-06-1998 06-05-1999 07-01-1998 01-08-1999 28-07-1998 23-02-1999 05-01-1998
GB 1032163	A	08-06-1966	NONE	